Scientific Review to Support Public Policy Regarding Exposure to Radiation from Wireless Communications Devices (e.g. cell phones)

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Abstract

Authorities reviewing health and environmental effects, and regulating radiofrequency (RF) electromagnetic radiation (EMR) from wireless devices face a large and mounting volume of scientific research, and rapid proliferation of alluring applications of wireless information technologies. Exposure standards are rooted in a variety of "authoritative reviews," but these reviews are neither comprehensive nor systematic. An obvious sign is that a small fraction of relevant literature is cited. With a Parliamentary Hearing, Health Canada acknowledged that 26 of 140 potentially relevant studies omitted from their review were applicable, with effects demonstrated below the exposure guideline, Safety Code 6 (SC6). High quality scientific review is necessary to underpin public health policies.

Background

Canada's Safety Code 6 (SC6)

- Health Canada's Safety Code 6 (SC6) was adopted by Industry Canada as the safety limits for exposure to non-ionizing EMR (3kHz to 300GHz). This is comparable to other standards in the US (FCC)and internationally (ICNIRP).
- The periodic review of SC6 includes an update on the science, most recently from 2009 to 2014.
- The Royal Society of Canada was contracted for scientific review.
- The Royal Society of Canada panel did not conduct a systematic, comprehensive review, including weighing of evidence, using established best practices.
- There was heavy reliance upon other "authoritative reviews."

Features of Systematic Review

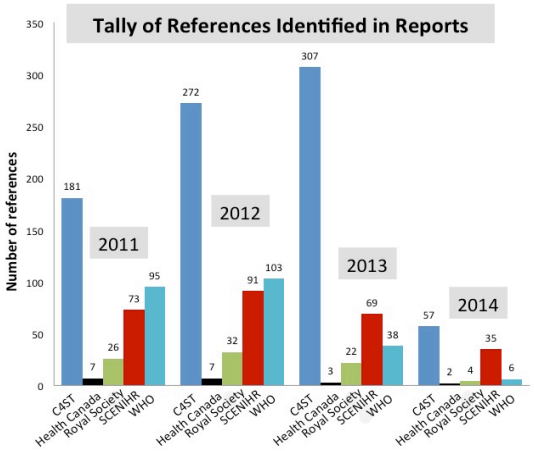
Systematic Review and Evidence Integration for Literature-Based Environmental Health Science Assessments – Essential Elements

(based on Systematic Review methodology delineated by Rooney et al.)

Component Description	Evident in Royal Society of Canada or Health Canada documents?	Comment
Formulate the problem and develop detailed study protocol, with peer review. Protocols include key questions, literature search strategies, evidence to be considered, synthesis and grading, and weight of evidence process.	✗	The opposite occurred. Questions posed by Health Canada to the Royal Society of Canada (RSC) were redacted from documents obtained under Access to Information.
Identify specific topics (key questions).	✔	Chapters in the RSC report parallel logical key questions, as do topics in C4ST 140 missing studies report.
Systematically and transparently search for and select studies. Provide sufficient literature search details to allow replication. Provide inclusion/exclusion criteria. Provide a flow chart depicting study selection. List excluded studies, with reasons.	✗	Search details, criteria and study lists not provided. No response was provided to repeated submissions, and a meeting. The Parliamentary Sanding Committee on Health obtained a response re. Canadians for Safe Technology report of the 140 recent studies indicating potential harm from current exposures, that had been omitted from the RSC report.
Extract, summarize and analyse data. Tabulate study details and summary results. Mathematically combine studies' results if feasible (meta-analysis)	✗	Not provided. Narrative summary without detailed results.
Systematically assess study quality, according to protocol. Quality reflects strengths and weaknesses in the context of the subject area.	✗	Not provided. Some discussion of some studies, but not conducted systematically nor comprehensively. Results not tabulated.
Rate confidence in the bodies of evidence, using the individual assessments.	✗	Not conducted. Builds upon previous poor reviews that omit substantial literature.
Translate confidence in bodies of evidence into levels of evidence for health effects with various exposures.	✗	Not conducted. Builds upon previous poor reviews that omit substantial literature.
Integrate evidence to develop hazard identification and risk assessment.	✗	Not conducted. Builds upon previous poor reviews that omit substantial literature.

Evidence Lacking in Reviews

A preliminary measure of review quality may be the number of studies referenced.



C4ST= Canadians for Safe Technology (2014), (n=817);
Health Canada = Safety Code 6 (2015) Rationale, (n=19);
RSC= Royal Society of Canada Expert Panel Report (2014), (n=84); **SCENIHR** = Scientific Committee on Emerging and Newly Identified Health Risks (2015), European Commission (n=268);
WHO= World Health Organization, Electromagnetic Fields (EMF) Radio Frequency Fields: Environmental Health Criteria Draft Monograph (2014), (n=242).

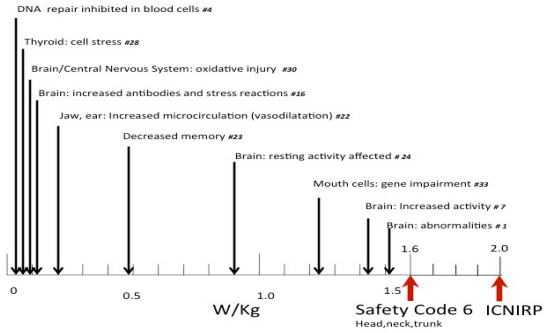
Health Canada and the Royal Society of Canada, as well as the cited "authoritative reviews," failed to capture 140 publications (2009 to 2014) that indicated significant effects of RF EMR. [1]

Topic	Total studies not reviewed Safety Code 6 (2015)
A1. Cancer (2011-2014)	11
A2. Genetic Damage (2011-2014)	14
B. Male and Female Infertility	14
C. Impairment to Development, Learning and Behaviour from Conception to Old Age	31
D. Effects on the Brain and Nervous System	44
E. Effects on the Eye	6
F. Cardiovascular Effects	4
G. Electrohypersensitivity (EHS)	9
H. Biochemical Effects	65
TOTAL UNIQUE PUBLICATIONS[2]	140

[1] Submitted July 15, 2014, in response to Health Canada consultation on Draft Safety Code 6. Available at www.c4st.org/website-pages/c4st-reviews-ignored-studies.html
[2] Some publications cover more than one topic area

Biological effects below Safety Code 6 SAR for the head, neck and trunk (1.6 W/kg), indicated in studies Health Canada did not reference, but agreed were relevant

Human, animal and cell culture studies, with Specific Absorption Rate (SAR) data from original papers, and from EMF Portal (www.emf-portal.de). References are available at www.c4st.org/HESA2015



Conclusions

- Without comprehensive, systematic scientific review, Safety Code 6 and similar standards are not scientifically sound, and are not a sound basis for public policies.
- If a substandard review erroneously identifies a lack of risk, public health may be compromised.
- High quality systematic reviews are required for decision-makers.
- There are no existing sound reviews, so *de novo* review is necessary.
- Methodology and reporting standards for research and reviews should meet established best practices in environmental health.
- Scientific review panels require methodological and subject matter experts, who are balanced in opinion at the outset regarding the potential health effects of RF radiation.
- The scientific evidence database should be routinely updated to detect when to re-evaluate. Data collections should include:
  - publically available databases reporting incidence data relevant to potential links between health effects and exposure to EMR, with sufficient diagnostic details to support studies to detect and track trends in specific brain tumours, superficial breast cancers and other conditions such as aspects of infertility, potentially associated with uses of wireless devices.
  - exposure determinations, and assessments from multiple sources, to mesh with health outcomes research.

Precautionary approaches are required now, so that electromagnetic radiation from wireless communications devices are *As Low As Reasonably Achievable* (ALARA). This should include minimizing exposures to protect the most vulnerable populations such as children and pregnant women.

RESOURCES

1. Rooney AA, Boyles AL, Wolfe MS, Bucher JR, Thayer KA. Systematic Review and Evidence Integration for Literature-Based Environmental Health Science Assessments. Environ Health Perspect. 2014 Apr 22 [cited 2014 Apr 24]; Available from: http://ehp.niehs.nih.gov/1307972
2. Reports on 140 omitted studies, Health Canada's responses and the HESA hearing are available on the Canadians for Safe Technology website C4ST.org

Bioelectromagnetics Society, and European Bioelectromagnetics Association Meeting, Monterey CA, USA. Jun 15, 2015.